PLAINTIFF'S EXHIBIT

CT-995

AWWA No. M16

Work Practices for Asbestos-Cement Pipe

AMERICAN WATER WORKS ASSOCIATION

MANUAL OF WATER SUPPLY PRACTICES

CTD032641

Work Practices for Asbestos-Cement Pipe Manual

American Water Works Association
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CTD032642

Committee Recognition

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CTD032643

Acknowledgment

A C Pipe Producers Assn. ("ACPPA") prepared, published, and copyrighted a pamphlet in 1977, "Recommended Work Practices for A/C Pipe," which formed the basis for this manual. AWWA received ACPPA permission to reproduce the pamphlet as part of AWWA Manual 16, "Work Practices for Asbestos-Cement Pipe."

CTD032644

CTD032645

Table of Contents

CTD032646

Foreword

The Occupational Safety and Health Act in the US and similar laws in Canada and other countries were enacted to ensure so far as possible every worker a safe and healthful work place. This legislation is far reaching. It covers millions of employees and nearly every employer, including those involved in utility duct and pipeline construction.

In keeping with the spirit and intent of these laws, this committee has reviewed information regarding the potential hazards of exposure to airborne asbestos and the means of reducing such potential hazards through good work practices.

This manual is about good practices. The recommendations that follow are the result of field testing and were developed through study.[1,2] They are intended as general guides to achieve safe and clean job-site conditions when working with asbestos cement (A-C) pipe products. Since field conditions will vary, adherence to these work practices will not guarantee compliance with national, state, or local regulations. Questions relating to compliance should be directed to appropriate regulatory agencies.

The committee believes this report will be helpful to engineers, utility managers, superintendents, contractors, foremen, and laying crews in understanding and explaining established procedures for the safe handling of A-C pipe products.

Asbestos and health. Prolonged or heavy exposure to airborne asbestos fiber has been identified as a possible health hazard. Very few things to which man is exposed are "zero risks," but as for the automobile, electricity, and x-rays, there are non-harmful ways to use potentially harmful things.

Experience has shown that minimizing exposure to airborne asbestos dust is the only effective method of preventing asbestos-related diseases. Recommended work practices are the best insurance of providing exposure safeguards for employer and employee.

Generally, A-C pipe products contain less than 20 per cent asbestos. The asbestos fibers are not free but encapsulated or "locked-in" the cement binder like reinforcing rods in concrete. The distinction between "free" and "bound" asbestos is extremely important. First it determines the probability of fiber release, which in turn directly relates to the probability of risk. It explains why A-C pipe is a non-harmful use of asbestos.

Many studies have been made to establish a link between asbestos ingested with potable water and cancer. All such studies have proved negative. The USEPA and the State of Connecticut recently reported on an epidemiological study conducted in that state to find a relationship between the use of A-C pipe and cancer. It was reported that[3]

> The preliminary findings of the epidemiology study did not show any excess in cancer incidence for stomach, colon, or rectum in Connecticut townships during 1935-1973 that could be related to the use of asbestos-cement pipe for drinking water.

A select study group sponsored by the AWWA Research Fdn. reported[4]

CTD032647

No firm evidence shows that the proper use of asbestos-cement pipe poses a hazard to health by reason of ingestion of asbestos fibers. Calculations comparing the probable ingestion exposure in occupational groups to that likely to occur as a result of ingestion of potable water from asbestos-cement pipe systems suggest that the probability of risk to health from the use of such systems is small—approaching zero.

Summary of OSHA asbestos standard. The Occupational Safety and Health Act was signed into law on Dec. 29, 1970, and became effective on Apr. 28, 1971. On Dec. 7, 1971, the secretary of labor issued a temporary standard for exposure to asbestos dust. As required by the act, a permanent standard for asbestos exposure was promulgated six months later.

Under the current standard, it is the employer's responsibility to ensure that exposure of employees to airborne concentrations of asbestos fibers does not exceed the following "permissible exposure levels":

1. Time weighted average (TWA) is the permissible exposure level to airborne concentrations of asbestos fibers longer than 5 μm on an 8-hr time-weighted average, as determined on the basis of a 40-hr work week and by the method prescribed in "Standard for Exposure to Asbestos Dust" promulgated by OSHA, June 7, 1972. The present TWA permissible exposure level is 2 fibers/cm^3.
2. Ceiling concentration is the maximum level of exposure to airborne concentrations of asbestos fibers longer than 5 μm as determined for a period of up to 15 min by the method prescribed in "Occupational Exposure to Asbestos" published by OSHA. The present permissible ceiling concentrations is 10 fibers/cm^3.

In October 1975 OSHA proposed a revision to the existing standard, which would reduce the 8-hr time-weighted average exposure to 0.5 fibers per cubic centimeter. In its notice, OSHA stated that a separate "construction industry standard" would be issued to cover workers who handle asbestos-containing products.

The work practices recommended in this manual are based on data for "ceiling dust concentrations" representing short periods of maximum exposure. (Field-cutting and machining operations involving A-C pipe are normally infrequent and of short duration.) Using these recommended work practices, it is improbable that field personnel would be exposed in a typical working day to levels exceeding the 8-hr time-weighted average.

References

1. Dust Exposures During the Cutting and Machining of Asbestos-Cement Pipe. Report prepared by Equitable Envir. Health, Inc. (Mar. 1977).

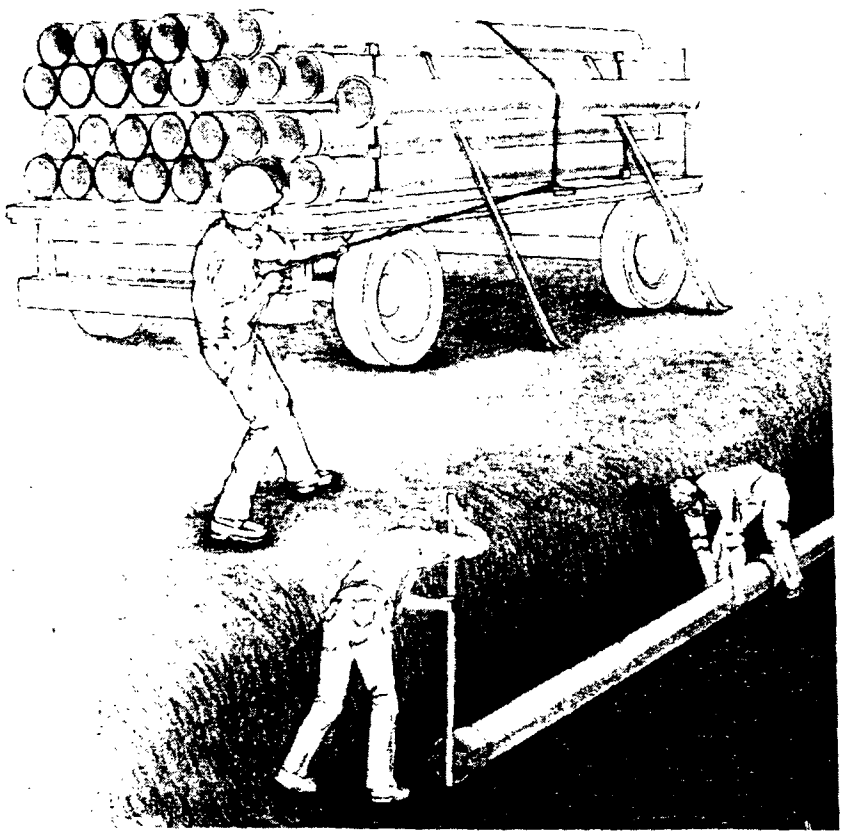
1a. Additional studies (Dec. 15, 1977).

2. News from TAC. TAC Construction Mtls., Ltd. (Report of a survey from the Occupational Hygiene Unit of North of England Indl. Health Svce.) (Feb. 1977).
3. Exposure to Asbestos Fibers in Water Distribution Systems. AWWA Ann. Conf., Anaheim, Calif. (May 1977).
4. A Study of the Problem of Asbestos in Water. *Jour. AWWA*, 66:9 (Sep. 1974, pt. 2).

CTD032648

Section 1
Recommended Work Practices

Shipping, Receiving, Handling, Assembly and Disassembly of A-C Pipe in All Size Ranges.



A-C pipe is shipped clean from the factory and carefully loaded using methods acceptable to the carrier. Loading, unloading, stringing out, and assembling A-C pipe are essentially dust-free operations. Even in enclosed spaces, airborne asbestos fiber levels from pipe-handling operations are far below existing and proposed occupational standards.

All hand- and mechanical-unloading operations should be carried out in accordance with the manufacturer's installation manuals.

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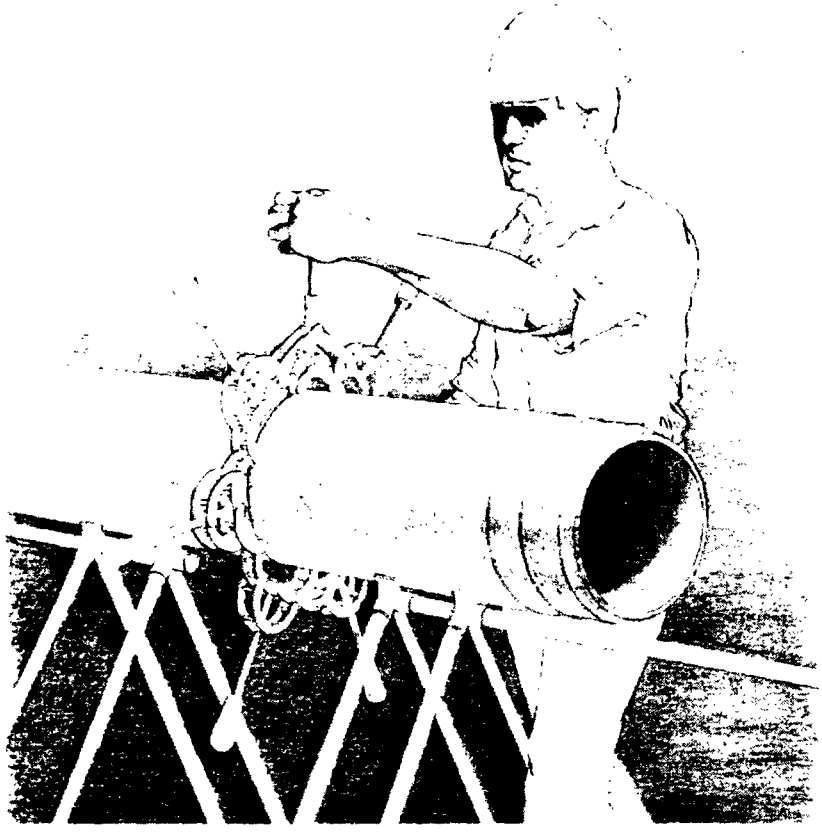
Cutting of all A-C Pipe, in Sizes From 3 in. Through 24 in. Using Carbide-Tipped Blades.



Blade cutters consist of a frame adjustable to the circumference of the pipe and a number of self-tracking rollers that align one or more carbide-tipped cutting blades. Blade cutters are typically hand-operated. Because of the relatively low mechanical input and clean cutting action, significant amounts of airborne asbestos dust are not produced. Waste material is disposed of in accordance with "Housekeeping and Waste Disposal," Section 3.

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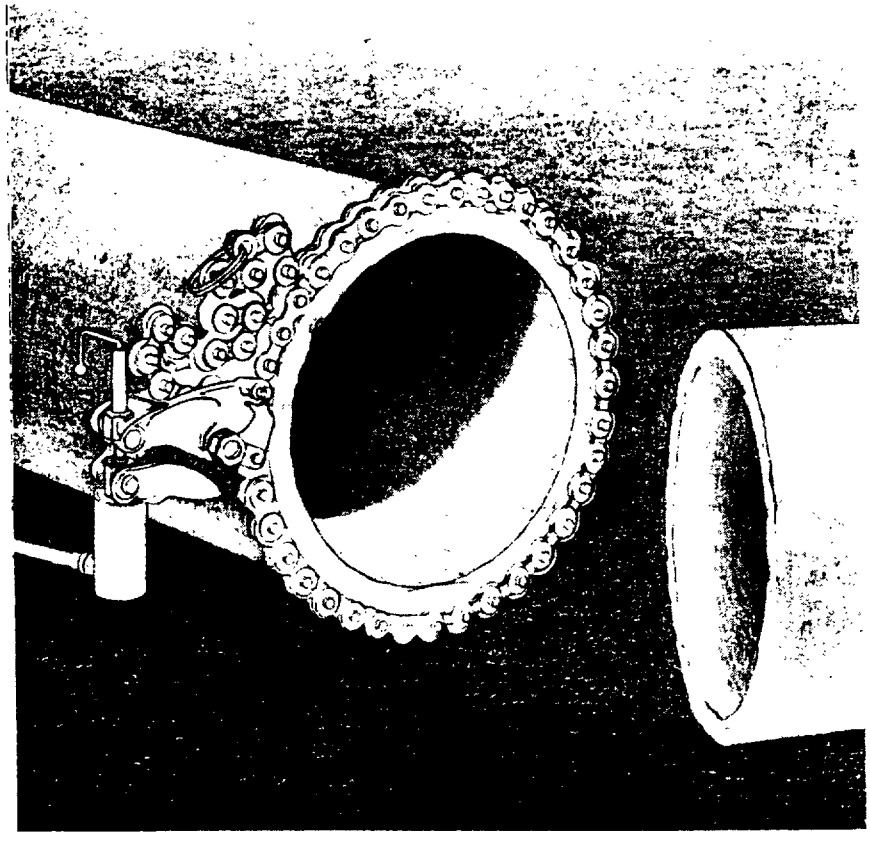
Cutting of all A-C Pipe in Size Ranges 3 in. Through 24 in.* Using Snap Cutters.



Snap cutters ("squeeze-and-pop" equipment) operate by means of cutting wheels mounted in a chain wrapper around the pipe barrel. Hydraulic pressure, applied by means of a remote electrically, pneumatically, or manually operated pump, squeezes the cutting wheels into the pipe wall until the cut is made. Waste material is disposed of in conformance with "Housekeeping and Waste Disposal," Section 3.

* Applicable also to pressure, gravity and building sewer, storm drain, air, electrical, and telephone duct in sizes 3 in. through 36 in.

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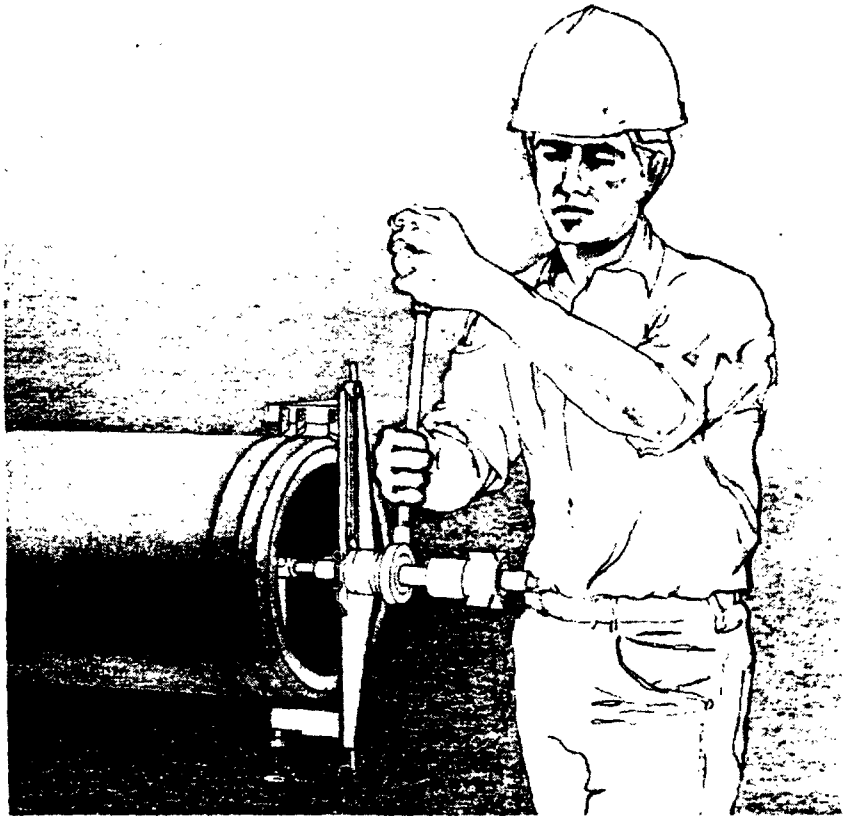
Machining of all A-C Pipe in all Sizes Using Manual Field Lathe.



Manual field lathes are designed to end-trim and remachine rough pipe barrels to factory-machined end profiles. The lathe consists of an adjustable, self-aligning arbor inserted into the pipe bore (which acts as a mandrel upon which the turning handle operates), a screw-fed turning frame, carbide machining blades, and manual (hand or ratchet) turning handles. Waste material is disposed of in accordance with "Housekeeping and Waste Disposal," Section 3.

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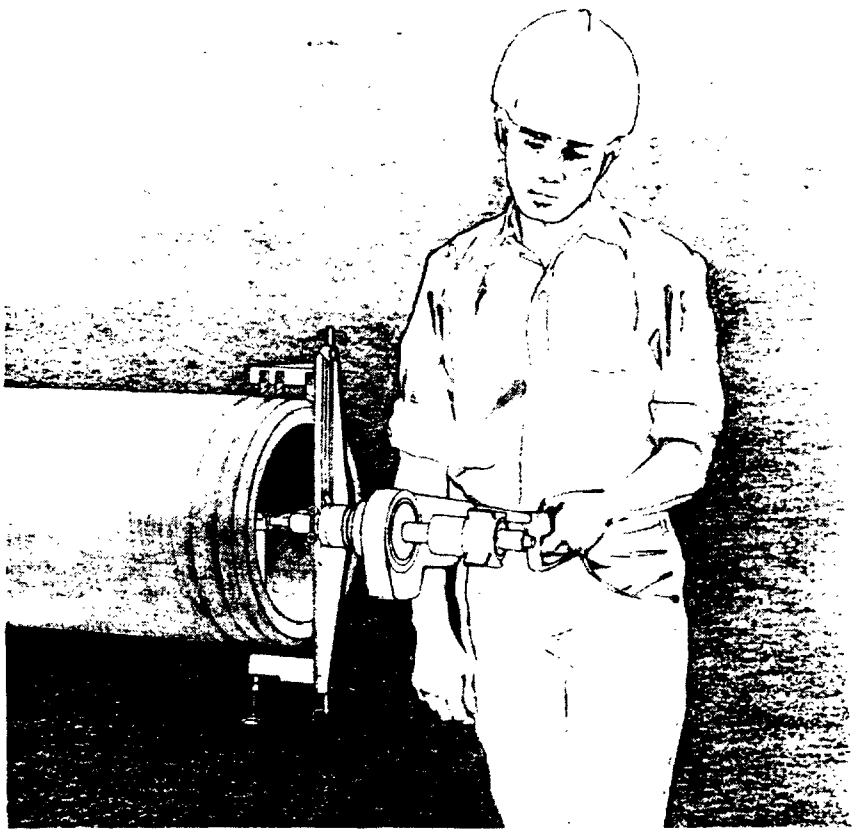
Machining of all A-C Pipe in all Sizes Using Power-Driven Field Lathe.



Power field lathes, like manual lathes, are designed to end-trim and remachine rough pipe barrels to factory-machined end profiles. The lathe consists of an adjustable, self-aligning arbor inserted into the pipe bore (which acts as a mandrel upon which the turning handle operates), a screw-fed turning frame, carbide machining blades and electric- or pneumatic-power drive. Waste material is disposed of in accordance with "Housekeeping and Waste Disposal," Section 3.

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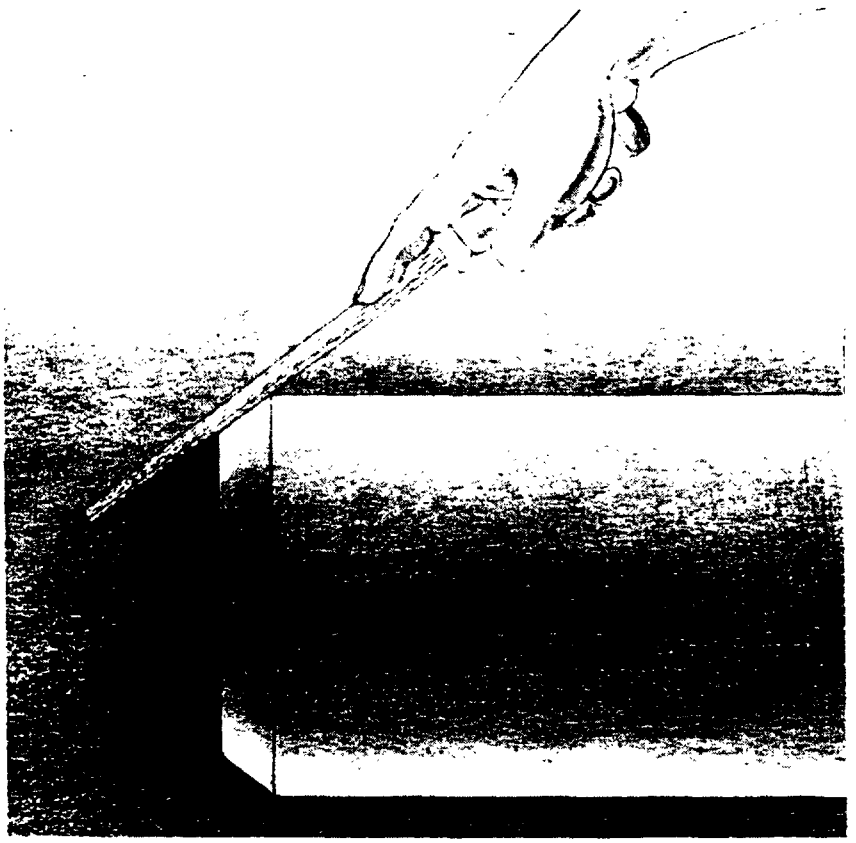
Machining of all A-C Pipe in all Sizes Using A Manual Rasp.



Short lengths of A-C pipe, machined-end exclusively (MEE) and machined overall (MOA), can be cut to make closures and repairs and to locate fittings exactly. Field-cut ends may be rebeveled with a coarse wood rasp to form a taper approximating the profile of the factory-beveled end. Waste material is disposed of in accordance with "Housekeeping and Waste Disposal," Section 3.

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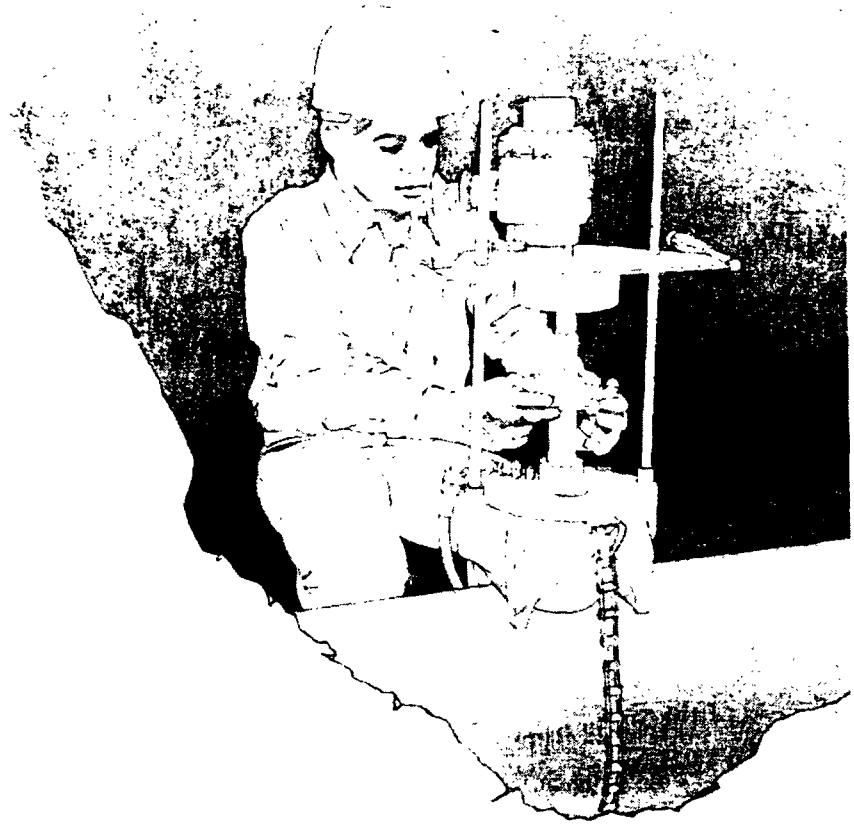
Hole Cutting in A-C Pipe* of all Sizes Using Shell Cutters.



For field connections into A-C pipe, clean, even entry cuts may be accomplished by means of shell-cutting equipment. Shell cutters consist of a hole-cutter housing mounted on the pipe, a carbide- or diamond-tipped hole cutter, and a manual ratchet or a pneumatic, electrical or gasoline drive to power the cutting head.

When cutting holes in A-C pipe products, all dust and cuttings should be removed from the pipe or duct interior after the cutting operation. Removal may be accomplished by flushing with water, wet mopping, or vacuuming prior to placing in service. *Do not blow out with compressed air, or dry sweep.* Waste material is disposed of in accordance with "Housekeeping and Waste Disposal," Section 3.

*Technique applicable for pressure-, gravity-, and building-sewer pipe as well as air ducting.

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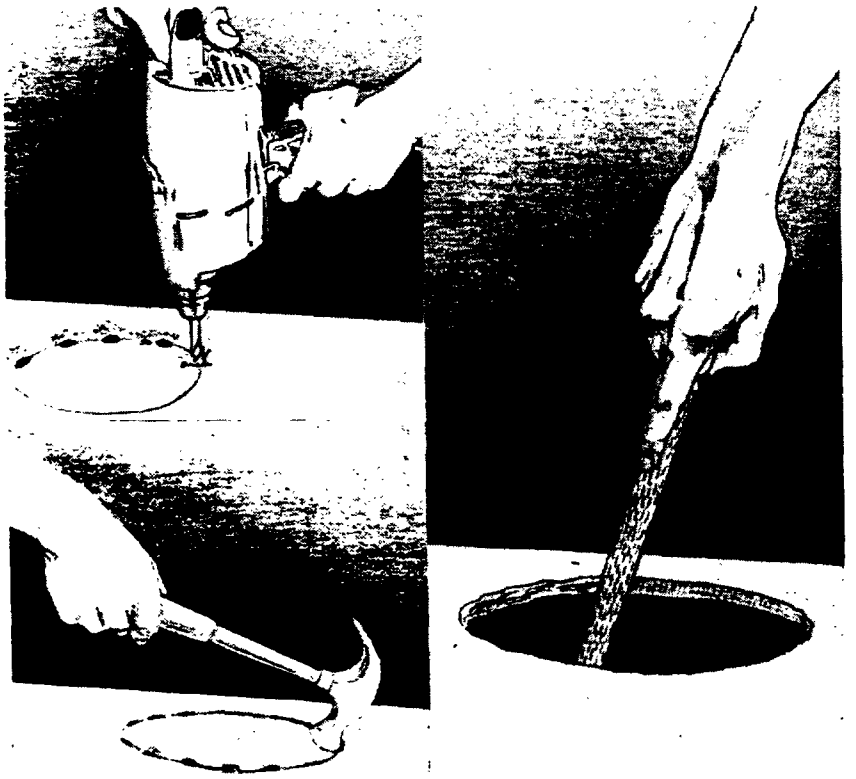
Hole Cutting in A-C Pipe* of all Sizes Using Drill and Rasp.



Field connections may be made with a heavy-duty electrical drill and rasp. Using a carbide-tipped drill, a series of closely spaced holes first are drilled around the hole outline. The disc is knocked free with a hammer and the edges of the hole are dressed with a coarse wood rasp.

When cutting holes in A-C pipe products, all dust and cuttings should be removed from the pipe or duct interior after the cutting operation. Removal may be accomplished by flushing with water, wet mopping or vacuuming prior to placing in service. *Do not blow out with compressed air, or dry sweep.* Waste material is disposed of in accordance with "Housekeeping and Waste Disposal," Section 3.

*Applicable also to pressure, gravity and building sewer and air duct.

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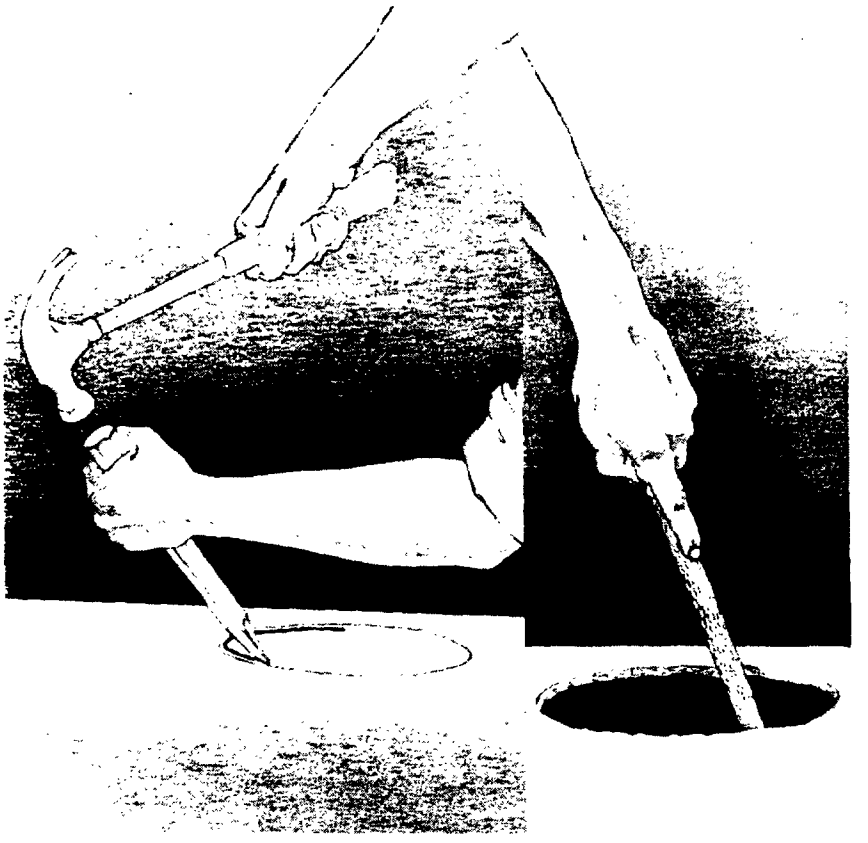
Hole Cutting in A-C Pipe* in all Sizes Using Chisel and Rasp.



Holes may be cut into A-C pipe with a hammer and chisel. The edge of a plumber's wood chisel is used to cut completely around the hole outline, about ¼ in. (7 mm) from the prescribed line. The operation is repeated and the cut deepened until through. The edges of the hole are then dressed with a coarse wood rasp.

When cutting holes in A-C pipe products, all dust and cuttings should be removed from the pipe or duct interior after the cutting operation. Removal may be accomplished by flushing with water, wet mopping or vacuuming prior to placing in service. *Do not blow out with compressed air, or dry sweep.* Waste material is disposed of in accordance with "Housekeeping and Waste Disposal," Section 3.

* Applicable also to pressure, gravity and building sewer and air duct.

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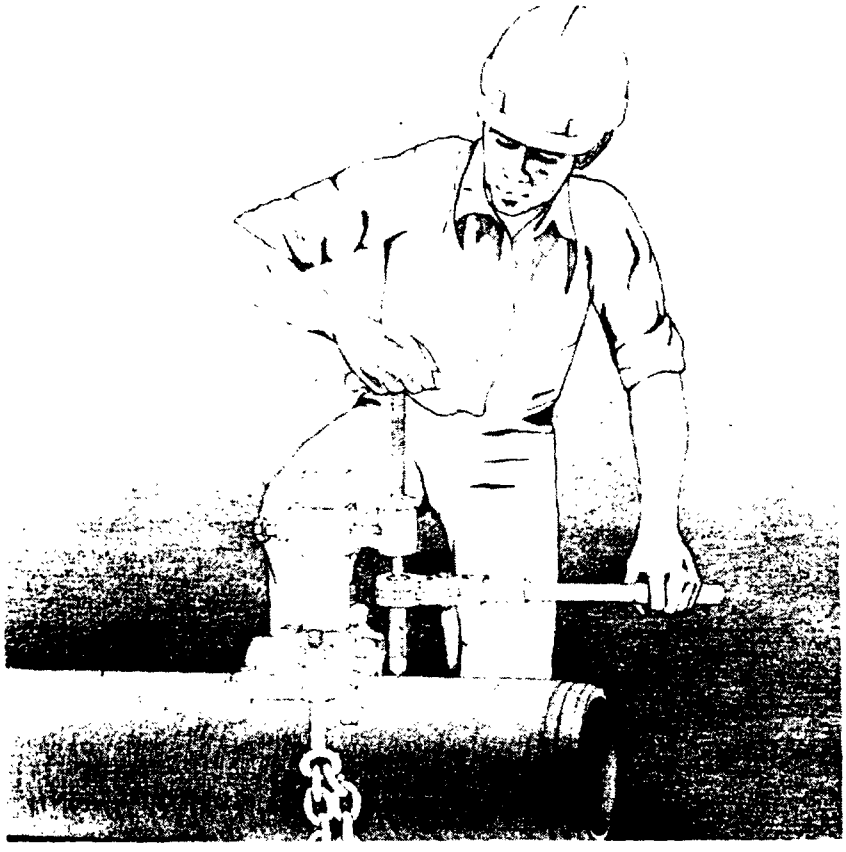
"Dry" Tapping of A-C Pressure Pipe in all Sizes.



Nonpressure or "dry" tapping for service connections may be performed in or out of the trench. The equipment is affixed to the pipe by means of a chain yoke. Separate drills and taps or a combination tool is used to drill and tap the pipe wall. Corporation stops or other connections may then be affixed to the pipe.

To minimize (1) the fouling of valves, regulators, meters, and other equipment with chips and (2) the unnecessary addition of asbestos to drinking water, all dust and cuttings should be removed from the pipe's interior by flushing with water, wet mopping, or vacuuming prior to placing the pipe in service. *Do not blow out with compressed air, or dry sweep.* Waste material is disposed of in accordance with "Housekeeping and Waste Disposal," Section 3.

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"Wet" Tapping of A-C Pressure Pipe in all Sizes.

Pressure or "wet" tapping for service connections is performed in the trench while the pipe is under pressure. The equipment (manual or power driven) is affixed to the pipe by means of a chain yoke. A combination boring-and-inserting bar drills and taps the pipe wall and inserts a corporation stop or pipe plug. The pressure chamber, which protects against water leakage, also catches the asbestos-cement chips, so this is essentially a dust-free operation.

To minimize (1) the fouling of valves, regulators, meters, and other equipment with chips and (2) unnecessary addition of asbestos to drinking water, provisions should be made for downstream flushing or use of tapping equipment with positive purge or "blow-off" features. Waste material is disposed of in accordance with "Housekeeping and Waste Disposal," Section 3.

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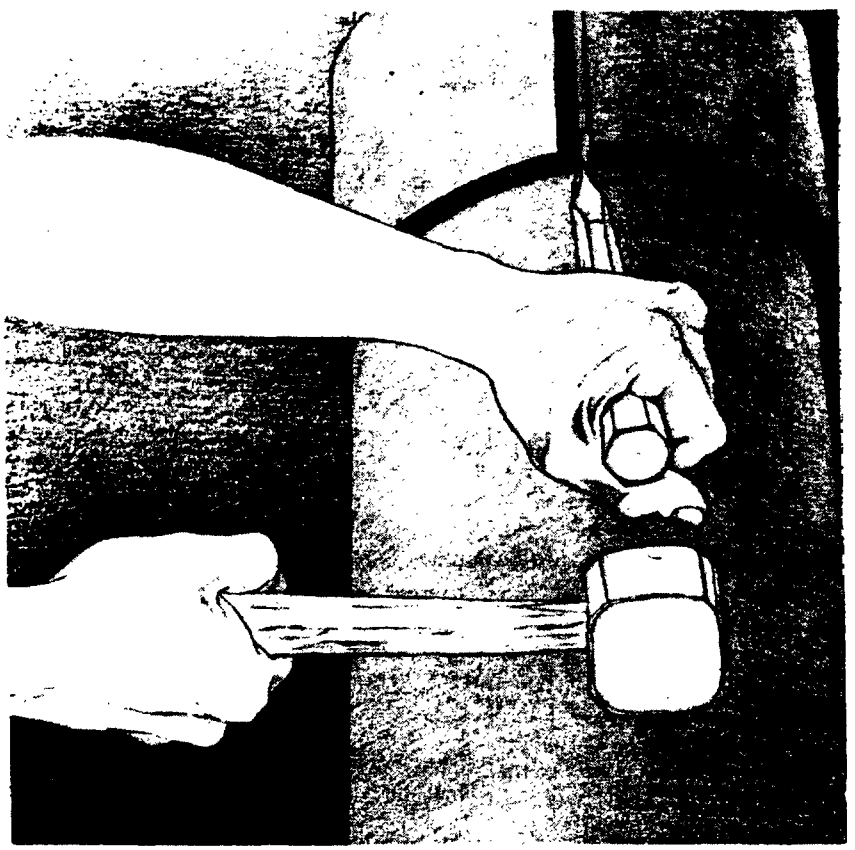
A-C Coupling Removal From all Pipe in all Sizes Using Hammer and Chisel.



Replacement of damaged pipe necessitates excavation, exposure and removal. A-C coupling removal may be accomplished by gradually splitting the coupling lengthwise using a chisel and hammer. After the top of the coupling has been split, a crowbar or similar tool is used as a lever to split the bottom of the coupling. Waste material is disposed of in accordance with "Housekeeping and Waste Disposal," Section 3.

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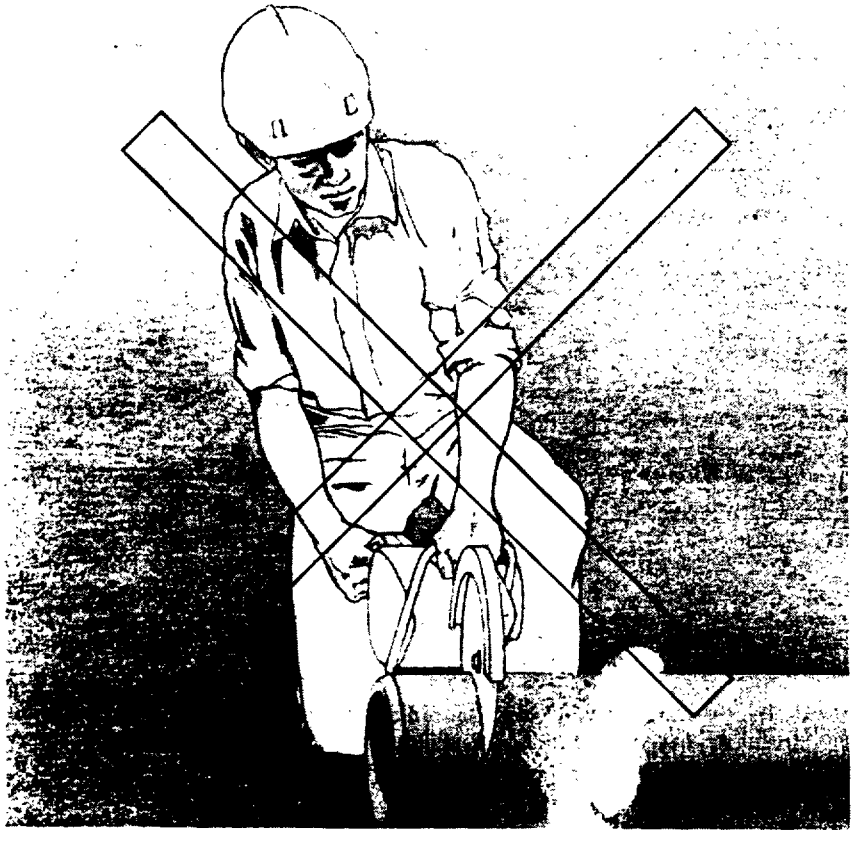
Section 2
Non-Recommended Work Practices

Cutting Any A-C Pipe Using Abrasive Disc-Dry Tools.



Power-driven saws with abrasive discs (masonry blades) should not be used for dry cutting or beveling A-C pipe. Abrasive disc cutters produce concentrations of airborne dust that exceed OSHA permissible levels. *This work practice is therefore specifically not recommended.*

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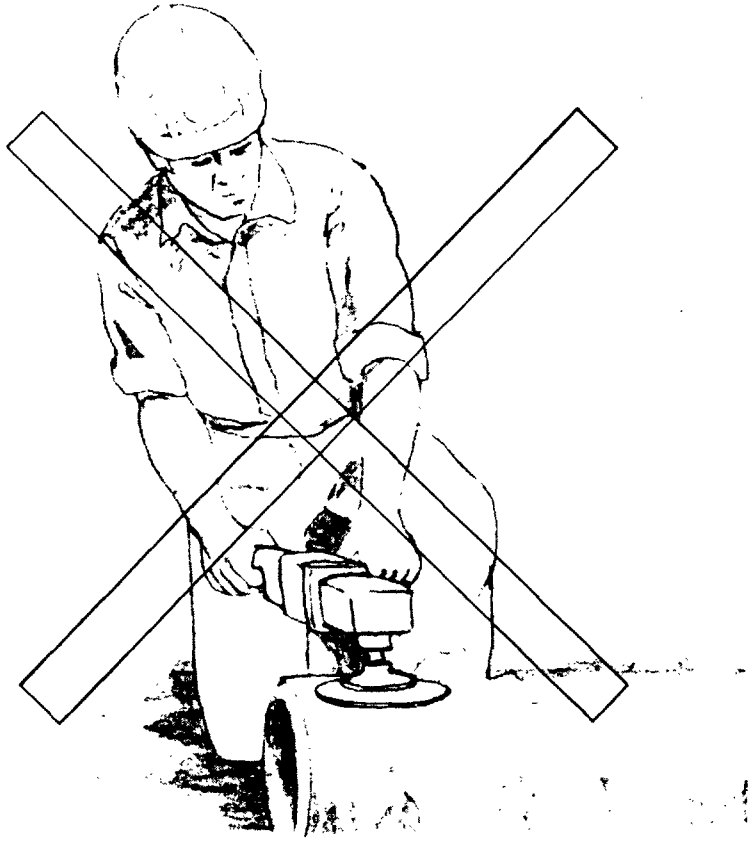
Machining Any A-C Pipe Using Right-Angle Sanders or Other Dry High-Speed Abrasive Tools.



Power-driven abrasive-disc sanders should not be used for shaping or beveling A-C pipe. Abrasive discs produce concentrations of airborne dust that exceed OSHA permissible levels. *This work practice is therefore specifically not recommended.*

Section 3
Housekeeping and Waste Disposal

Housekeeping is an important part of any safe construction operation. It is even more essential when airborne dust created by the lack of good housekeeping has the potential for harm to employees or others.

Care of Equipment

All external surfaces of equipment should be maintained free of A-C pipe dust accumulations that might, if dispersed, create asbestos-fiber concentrations above permissible exposure limits.

Waste Disposal.

Waste disposal at construction site. A-C chips and cuttings from the field operations described here should be disposed of in a manner that will not contribute airborne asbestos dust to the atmosphere. Where cutting and machining operations are performed at the construction site, the chips should be placed in the trench in such a manner as to avoid raising dust and should be buried with the pipeline.

Waste disposal at central or stock location. Where operations are performed at a central location such as a contractor's or corporation's yard on a more or less continuing basis, the chips and cuttings may be collected and mixed wet with cement and made into nonfriable forms. These forms may be used in the trench as supports for cast-iron fittings and valves, as appropriate.

Otherwise, chips and cuttings should be collected in sealed bags or closed containers impervious to asbestos dust. Loose material should never be dry-swept. When vacuum equipment is available, it should be used. Water or other dust suppressants should be applied in circumstances where sweeping is unavoidable. *Do not blow waste material with compressed air.*

No visible emissions to the atmosphere may result from the collection, processing, packaging, transporting, or deposition of any asbestos-containing material. Wastes should be disposed of at a site operated in accordance with the requirements of applicable national, state, or local laws.

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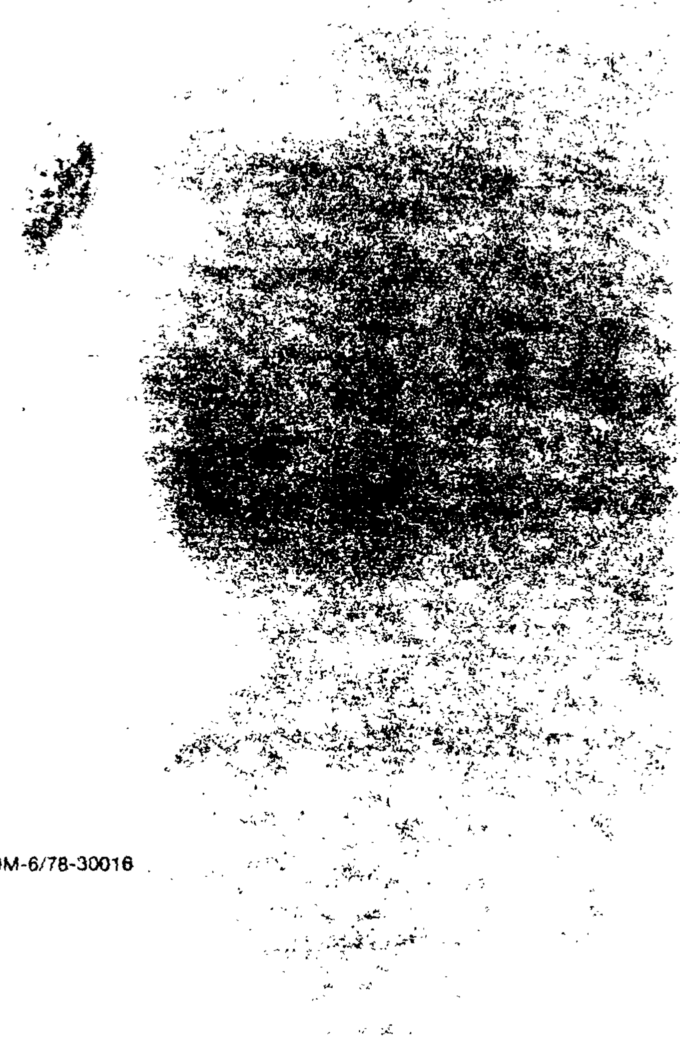

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